

SOME NORTH AMERICAN SPECIES OF THE DEVONIAN TETRACORAL *SMITHIPHYLLUM*

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ABSTRACT. The tetracoral genus *Smithiphyllum* is emended. It is shown to be closely related to *Tabulophyllum* and consequently is transferred from the Spongophyllidae to the Endophyllidae.

Additional material of the type species, *S. imperfectum* (Smith), is described and three new Frasnian species, *S. belanskii* from Iowa, *S. kindlei* from Alberta, and *S. whittakeri* from the Northwest Territories, are erected.

SPECIES now assigned to *Smithiphyllum* were first erected for specimens from Timan, at the turn of the century. Since then, others have been named for North American specimens, but recent workers have referred these to quite different genera and even families.

Apart from the description of new species, the purpose of this paper is to redefine the genus and elucidate its relationships.

The following abbreviations are used:

GSC for Geological Survey of Canada (Ottawa) type number
SUI for State University of Iowa (Iowa City) type number
N.W.T. for Northwest Territories.

SYSTEMATIC PALAEOLOGY

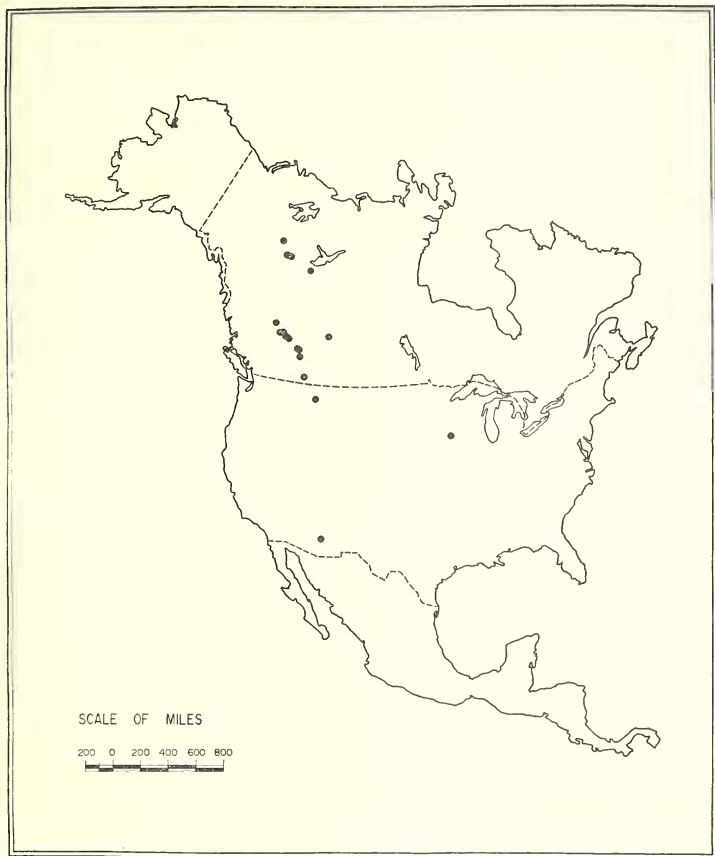
Family ENDOPHYLLIDAE Torley 1933

Genus SMITHIPHYLLUM Birenheide 1962, emend.

Type species (original designation). *Spongophyllum imperfectum* Smith. See below, p. 622.

Description. Fasciculate to subcerioid tetracorals with a relatively thick wall. The septa are radially arranged, typically smooth and clearly differentiated into two orders. The major may be withdrawn both axially and peripherally and the minor are commonly represented merely by ridges on the interior of the wall and short crests on the dissepiments. The dissepimentarium is narrow and may be lonsdaleoid; in some species, including the type, it is only intermittently developed. The tabulae are broad and in narrow corallites many are complete. They are generally gently sinuous in longitudinal section and are commonly downturned peripherally.

The minute skeletal structure is imperfectly preserved in much of the material studied. The skeletal material of the wall is almost entirely lamellar. As seen in transverse section the lamellae are deflected towards the axis at the bases of the septa and in longitudinal section they lie oblique to the wall surfaces with their upper edge away from the periphery. A thin dark line (axial plate of Flower 1961, p. 28) separates contiguous corallites; however, no trace of this is present in most free corallites. Fibre fascicles have not been observed, but sparse, dark, and apparently structureless spine-like bodies within the septa and walls may represent trabeculae.



TEXT-FIG. 1. Known distribution of *Smithiphyllum* in North American Frasnian beds. Occurrences indicated by a black circle.

Additional species assigned

Smithiophyllum belanskii sp. nov. See below, p. 623.

Smithiophyllum kindlei sp. nov. See below, p. 625.

Spongophyllum lituus Smith 1945, p. 56, pl. 11, figs. 5a-d. Redknife Formation (late Frasnian), Jean Marie River, N.W.T.

Spongophyllum martinense Stumm 1948, p. 41, pl. 11, figs. 9, 12; pl. 12, fig. 6. Martin Limestone (Middle Frasnian), Dear Creek Valley, Arizona.

Cyathophyllum stuckenbergii Lebedew 1902, pp. 179, 180, pl. 2, figs. 21-24. Uchta River, Timan. Probably Frasnian.

Cyathophyllum weberi Lebedew 1902, p. 178, pl. 4, figs. 49-53. Uchta River, Timan. According to Soshkina (1952, p. 70) this occurs in the Middle Frasnian D₂¹ 2-3 beds.

Smithiophyllum whittakeri sp. nov. See below, p. 626.

Species requiring further description

Spongophyllum expansum Stumm 1937, pp. 436, 437, pl. 53, fig. 11; pl. 55, figs. 6a, b. Basal 500 feet of the Nevada Limestone, Eureka region, Nevada. Stumm considered this to be a lower Middle Devonian species; it is now thought to be Emsian (Johnson 1962).

Spongophyllum nevadense Stumm 1937, pp. 435, 436, pl. 53, fig. 10; pl. 55, figs. 5a, b. Basal 500 feet of the Nevada Limestone (Emsian), Eureka region, Nevada.

Calophyllum tschernyschewi Lebedew 1902, p. 148, pl. 2, figs. 29-31. Uchta River, Timan. Probably Frasnian. See under the discussion of *S. imperfectum*.

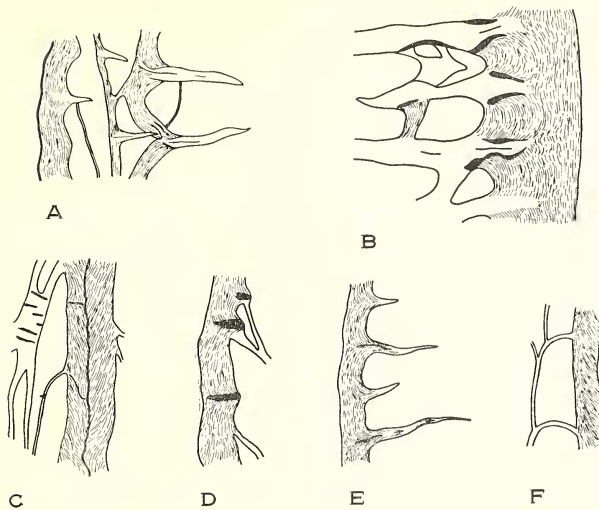
Distribution. At present the genus is known definitely only from the Frasnian of North America and Timan. Its distribution in the former is indicated in text-fig. 1. In addition to the described species the figure indicates the occurrence of some undescribed forms as well as others listed by Sloss and Laird (1945), Crickmay (1962, p. 4), and by McLaren and Mountjoy (1962, pp. 8, 23).

Discussion. Birenheide (1962, p. 82) included completely cerioid species, such as *Spongophyllum alpenense* Ehlers and Stumm, *S. brevisseptatum* Stumm, and *S. missouriense* Ehlers and Stumm, in the genus. The present writer prefers to regard these species as constituting either a new genus, or at least a subgenus. Another species included in *Smithiophyllum* by Birenheide is *Spongophyllum pax* Smith. This is based on a specimen found in a river boulder and is therefore of unknown stratigraphical origin. Crickmay (1960, pp. 878, 879) listed it in Givetian faunas from British Columbia, but Norford (1962, p. 27) has suggested that the species is Silurian and placed it in *Columnaria*.

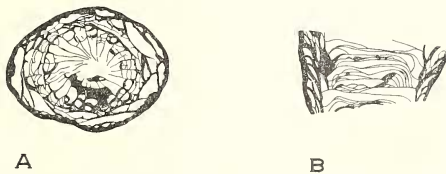
In recent years the species now grouped in *Smithiophyllum* have most frequently been referred to *Spongophyllum*. The latter cannot be said to be a fully understood genus since the minute structure of the type species is imperfectly known, but it does differ from *Smithiophyllum* in being cerioid and by having essentially concave tabulae and a well-developed dissepimentarium, even in very narrow corallites.

Smithiophyllum is close to *Tabulophyllum* (text-figs. 2B, D; 3A, B) and in fact Soshkina (1952, p. 70) assigned *S. weberi* to *Tabulophyllum*. Both genera possess a lamellar wall, broad typically peripherally downturned tabulae, and similar septa. Furthermore, the discontinuity, which is seen in the dissepimentarium of such species as *Smithiophyllum imperfectum* and *S. belanskii*, has also been figured in various species of *Tabulophyllum* (e.g. Frech 1885, pl. 10, fig. 2; Sloss 1939, pl. 11, fig. 18). *Smithiophyllum* is distinguished from *Tabulophyllum*, which is solitary, by its fasciculate to subcerioid form.

Birenheide (1962, p. 69) placed *Smithiophyllum*, and also doubtfully *Tabellaephyllum*, in the Spongophyllidae. However, this writer feels that the discontinuous crest-like septa and the peripherally downturned tabulae indicate a closer relationship with the Endophyllidae.



TEXT-FIG. 2. Minute skeletal structure (as far as preserved) in *Smithiphyllum* and *Tabulophyllum*. All $\times 15$. A, C. *Smithiphyllum belauskii* sp. nov., A from a transverse section of the paratype, SUI 11617, C from a longitudinal section of the holotype, SUI 11616. B, D. *Tabulophyllum mccoynelli* (Whiteaves), B from a transverse section of topotype, GSC 17547, from the Escarpment Formation (middle Frasnian) on Hay River, N.W.T. D from a longitudinal section of GSC 17548 from the Ferques Limestone (middle Frasnian) in the Parisienne Quarry, near Ferques, Boulogne region, France. E, F. *Smithiphyllum imperfectum* (Smith), from transverse and longitudinal sections, respectively, of GSC 17543.



TEXT-FIG. 3. *Tabulophyllum rotundum* Fenton & Fenton, $\times 2$. Based on topotype GSC 17549 from Cerro Gordo Member of the Lime Creek Formation at Rockford, Iowa. This specimen combines features considered by Fenton and Fenton (1924) as being diagnostic of both *T. rectum*, the type species of *Tabulophyllum*, and *T. rotundum*. A, transverse section. B, longitudinal section.

Smithiophyllum imperfectum (Smith 1945)

Plate 88, fig. 7; Plate 89, figs. 1-3, 10-12; text-figs. 2F, F, 4A-1

1945 *Spougophyllum imperfectum* Smith, pp. 55, 56, pl. 11, figs. 3a-g.

Holotype. GSC 6307. Upper Devonian, about one mile below the upper end of the middle gorge of Jean Marie River, N.W.T. In current stratigraphical terms (Belyea and McLaren 1962, pp. 6, 7) this specimen was obtained from the Redknife Formation (late Frasnian).

Other material. GSC 17543. Kakisa Formation (late Frasnian), 4 miles (direct) above the mouth of Poplar River, N.W.T. Collected by the writer in 1960 with *Endothyra* sp., *Mictophyllum modicum* Smith, *M. semidilatatum* Smith, *Hexagonaria magna* (Webster and Fenton), *Disphyllum* sp., *Tabulophyllum* sp. close to *T. mcconnelli* (Whiteaves), *Thamnopora* spp., *Alveolites* sp., *Syringopora* sp., *Schizophoria* sp., *Nervostrophia* sp., *Atrypa* sp., *Cyrtospirifer* sp., *Cranaena* sp., and *Scutellum* sp.

Description. The growth form is dendroid; in most cases the offsets diverge widely from the parent corallite so that the corallum has the appearance of being well spread out. Specimen GSC 17543, which was not completely collected, measured about $150 \times 100 \times 70$ mm. before sectioning. The corallites are sub-cylindrical and have an adult diameter of between 7 and 9 mm. Increase is lateral. The exterior of the exposed corallites bear rugae, but not interseptal ridges.

Although the wall is generally about 0.4 mm. thick, it varies between 0.25 and 0.75 mm. (Smith gives the range as 0.5 to 0.75 in the holotype); it consists of a very thin dark outer axial plate and an inner much thicker lamellar layer.

The septa are smooth, radially disposed and well differentiated into two orders. The major taper towards their axial extremity where they are very thin; most are continuous lamellae typically extending from one- to two-thirds the distance to the axis; some are peripherally withdrawn. The minor septa are very short, most are less than 0.5 mm. long and in young corallites they may be almost imperceptible. Number of major septa ranges from nineteen at 6.5 mm. diameter to twenty-two at 9.0 mm. diameter.

The dissepimentarium is intermittently developed and is entirely absent in some longitudinal sections; where it is developed it consists of a single row of elongate dissepiments numbering about ten in 10 mm.

The tabulae are broad and may be predominantly complete. Some are very nearly flat, but most are very gently sinuous as seen in longitudinal section.

Discussion. The synonymy and distribution of the species is fully treated elsewhere (Predder in press) and is not repeated here.

The cylindrical corallite described by Lebedew (1902, p. 148, pl. 2, figs. 29-31) under the name *Calophyllum tschernyschewi* is similar to isolated corallites of *S. imperfectum*.

EXPLANATION OF PLATE 88

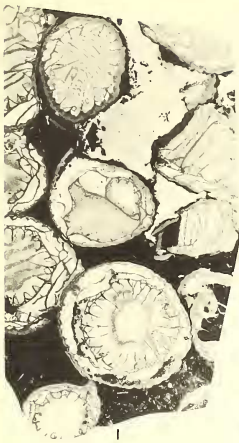
All figures $\times 2$

Figs. 1-3, 5. *Smithiophyllum belauskii* sp. nov. from the Shellrock Formation, Iowa. 1-3, Holotype, SUI 11616. 5, Paratype, SUI 11617.

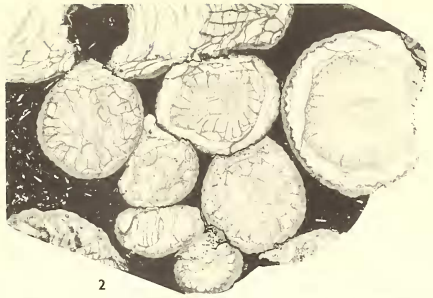
Fig. 4. *Smithiophyllum whittakeri* sp. nov. from the Redknife Formation, N.W.T. Holotype, GSC 17545.

Fig. 6. *Smithiophyllum kiudlei* sp. nov. from the Mount Hawk Formation, Alberta. Holotype, GSC 17544.

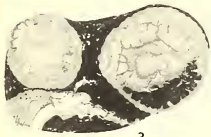
Fig. 7. *Smithiophyllum imperfectum* (Smith) from the Redknife Formation, N.W.T. GSC 17543.



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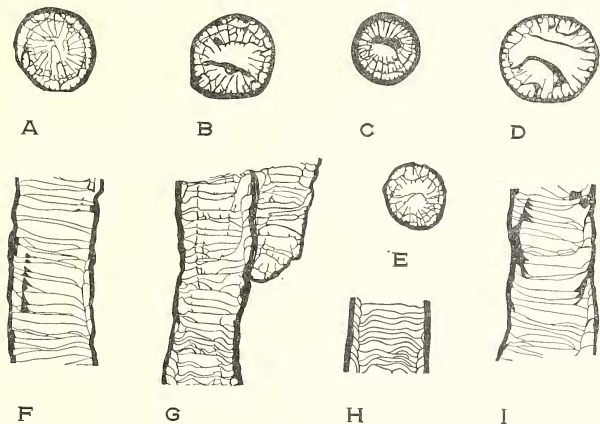


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If Lebedew's species is based on an individual corallite of a fasciculate corallum, it appears to differ from *S. imperfectum* only in having as many as twenty-seven major septa at its full diameter of 9 mm.



TEXT-FIG. 4. *Smithiphyllum imperfectum* (Smith), $\times 2$. Based on figures given by Smith and Birenheide of the holotype, GSC 6307, and original figures based on GSC 17543. A-C, E, transverse sections of the holotype. D, transverse section of GSC 17543. F, I, longitudinal sections of GSC 17543. G, H, longitudinal sections of the holotype.

Smithiphyllum belanskii sp. nov.

Plate 88, figs. 1-3, 5; Plate 89, figs. 13, 16; text-figs. 2A, C; 5A-D

Name derivation. The species is named for the late C. H. Belanski in recognition of his contribution to the study of the Shellrock Formation and its fauna.

Holotype. SUI 11616. Mason City Member of the Shellrock Formation (early Frasnian) at Nora Springs, Floyd County, Iowa. Collected by the writer in 1956 with calcispheres, stromatoporoids and *Phillipsastrea websteri* (Belanski).

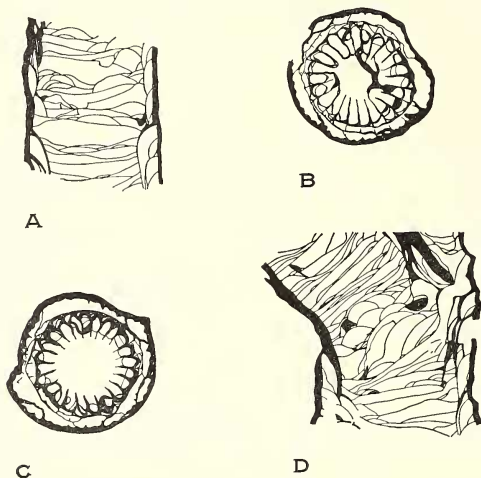
Paratype. SUI 11617. Same horizon, locality, and collector as the holotype.

Diagnosis. Maximum corallite diameter about 14 mm. Major septa up to twenty-five in number and withdrawn both axially and peripherally. Minor septa very suppressed. Dissepimentarium discontinuous.

Description. The corallum is dendroid to phaceloid. The largest specimen studied is the holotype, which was incompletely collected and measured about $100 \times 90 \times 60$ mm. before sectioning. Free corallites are subcylindrical, but contiguous ones may have their shape modified by pressure from adjacent corallites. They appear to have attained their full diameter of from 14 to 16 mm. slowly, so that most transverse sections show numerous

corallites of less than maximum diameter. Increase is lateral. The external features of the type specimens are completely masked by matrix.

The wall consists of an inner lamellar layer and a dark outer axial plate; the latter is extremely thin and only clearly visible between touching corallites. The thickness of the wall varies between 0.2 and 1 mm.



TEXT-FIG. 5. *Smithiphyllum belanskii* sp. nov., $\times 2$. Based on the holotype, SUI 11616 and the paratype, SUI 11617. A, D, longitudinal sections of the holotype. B, transverse section of the holotype. C, transverse section of the paratype.

The septa are meagrely developed, radially arranged, and are highly differentiated into two orders. The major are smooth and spring from either the interior of the wall or a dissepiment; in addition to being peripherally discontinuous, they are withdrawn axially, so that few extend more than two-thirds the distance to the axis and many

EXPLANATION OF PLATE 89

All figures $\times 2$

Figs. 1-3, 10-12. *Smithiphyllum imperfectum* (Smith) from the Redknife Formation, N.W.T. GSC 17543.

Figs. 4, 6, 19, 20. *Smithiphyllum whittakeri* sp. nov. from Redknife Formation, N.W.T. 4, 6, 20, Paratype, GSC 17546. 19, Holotype, GSC 17545.

Figs. 5, 7-9, 14, 15, 17, 18. *Smithiphyllum kindlei* sp. nov. from the Mount Hawk Formation, Alberta. Holotype, GSC 17544.

Figs. 13, 16. *Smithiphyllum belanskii* sp. nov. from the Shellrock Formation, Iowa. 13, Paratype, SUI 11617. 16, Holotype, SUI 11616.

